BeringWatch: Internet Facilitated Community Based Monitoring in the Bering Sea

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Abstract

BeringWatch is a tool for recording and communicating environmental and ecological events in order to empower remote communities on ecological issues. Our approach combines the use of existing environmental databases with a web-based access portal for efficient and standardized data entry. The existing databases were developed and refined by the Island Sentinel Program on St. Paul and St. George Islands, Alaska, over the past 10 years. It is designed to be expandable to accommodate the diverse needs of multiple communities and the potential for more detailed data formats. We are currently in the implementation phase of the initial system in a selection of remote Aleutian Island and Bering Sea communities, both in Alaska and Russia.

Introduction

Our program is based on a single important premise: for conservation efforts to be truly successful and sustained over long (i.e. biologically significant) time periods, there has to be activity and ownership at the local level. BeringWatch is essentially a method for remote communities to store and share local and traditional environmental data in a standardized format while insuring consistent data quality and accuracy. BeringWatch grew out of the Island Sentinel Program that developed on St. Paul and St. George Islands in the Bering Sea, Alaska, during the past 15 years. The original goal of the Island Sentinel Program was to reawaken the cultural tradition of the Aleut community observer or sentinel. The sentinels were the members of the community who were rooted by traditional observation methods, which, if stories are true, led Aleuts to be so skilled as to make proficient predictions about such things as weather and the impending arrival of seafarers.

There are two key aspects which make BeringWatch unique. First, the database resides on the internet, and second, it is designed as a network. Being web-based solves a number of equipment-based problems (compatibility of data entry and storage programs) and allows for broad networking. A network approach means that permission to access data is granted at the local level, providing local ownership, a necessary part of local stewardship. The network model is also well suited to incorporating rigorous data quality standards through continuous interaction between local observers, regional coordinators, data managers and scientific advisors. Through internet communication (verbal and written) and photographic documentation, this interaction is ongoing while people at different network nodes are separated geographically.

The types of environmental data and how it is collected and stored essentially break down into two broad categories: wide ranging descriptive data and more focused, detailed observations on specific species. The first category is very broad, could be entered by anyone in a community with minimal training and is primarily narrative. This could include anything strange (e.g. an unusual wildlife sighting) or anything the local observer sees as environmentally relevant. This can include local and traditional knowledge passed on to the observer by other community members. It can also include media uploads (e.g. photos) which are permanently linked to the record. The second category is more focused on detailed data from specific target species. This level of data collection involves training and setting up a protocol for the target species and is most likely to be carried out by dedicated and often paid observers, through the Island Sentinel Program or the rangers in the Russian Federation nature park, Beringia.

Our current goal for BeringWatch is to successfully make the transition from a Design/Build phase to an Implementation phase. Our experience at the recent Beringia Days 2008 International Conference held in conjunction with the Alaska Park Science Symposium in Fairbanks, Alaska, clearly demonstrated the need, value and desire for such a product, and several test communities in Alaska and Russia have signed on. We now need to provide sufficient support to get these communities up-and-running and in so doing, realize the potential of the system.

Our four current objectives are: 1) to continue to update the database and web portal in order to successfully accommodate the evolving needs of each test community; 2) to administer and maintain the web-based portal for efficient and standardized data entry; 3) to provide oversight and data collection training where necessary and practical; and 4) to develop metadata standards for the observation program.

Methods

Design

The basic methodology is based on the Island Sentinel model developed and refined on St. Paul Island. At each location there are one or more primary ("target" or "focal") species which are the main focus of attention. In addition to the primary species, observations of other important marine mammal species that are likely to be encountered in the area are recorded opportunistically. The primary species vary from location to location and can be added

or updated as the data collection process matures. One of the first tasks of operation at the local level is to refine the methodology to suit the specifics of each community or area and suite of species.

Focal species are chosen considering several criteria, including known consistency in availability, whether it can be consistently observed, and its ecological and local importance. Local importance can be defined as species that are of subsistence value to the community or embody important cultural relationships with the local environment. Ultimately the data collection format should include any species of plant or animal for which there is local importance or interest. Each focal species should be added one at a time so that a consistent protocol can be designed to maximize the reliability of the data over time. As focal species are chosen, it is important to make a conservative estimate about how much time it takes to get a good count or collect other relevant data, particularly in the worst conditions. If adding a new species will negatively impact the existing data collection then it is not advisable to do so. Instead, it is still possible to collect data on the new species but to keep it in the "Opportunistic" rather than the "Focal" category.

Photograph courtesy of authors

Figure 1. The next generation of Island Sentinels collecting water temperature data.

Quality Assurance/Quality Control

A critical component of a community based-monitoring program is the ability to insure the reliability and quality of the data that is collected. There are three basic levels of Quality Assurance/Quality Control (QA/QC) built into the current program that are designed to ensure the data being collected is reliable and of high quality. These are training, standardized methodology, and oversight. Each of these aspects are briefly touched upon here.

Training: Training will be conducted at centralized locations whenever possible. A recent training session for several Aleut communities that occurred on St. Paul Island in October 2008 is a good example of such an opportunity. Here we were able to review and design counting techniques for the communities present, use of the Sentinel database, and design an observation schedule for each location. The goal is to standardize the specific types of data and how it is collected. In doing so, the data will be made comparable across sites. Secondary training is equally important. The Beringia participants will be responsible for training anyone else in their area that will be collecting data. This includes formal assistants as well as anyone conducting secondary observations like schools or other community members.

Standardized Methodology: Training emphasizes the importance of entering data in a timely manner in order to ensure quality is maintained. The Pribilof Island Sentinel programs use a PDA or handheld field computer system to insure that data entry is standardized automatically in the field, and the chance of error during this stage of activities is greatly reduced. Other communities will rely on paper forms or notebook formats that provide a standardized template for recording necessary data fields. Proofing data after it has been entered is part of the scheduled data collection activities and occurs on a regular basis.

Finally, reliability tests will be taught during training and conducted subsequently by Sentinels. Two data sets are routinely focused upon: animal counts and species identifications. Tests are conducted in order to ensure the results are correct, or in the case of counts, are within a preset tolerance range. These tests can be conducted at the same time, through observations. However, these tests are often best conducted with video examples. Ultimately we envisage a standardized video, a general version which could be made centrally and to which locally made parts could be added.

Oversight: The final aspect of QA/QC involves oversight. A more detailed QA/QC protocol will provide a framework for recording observation activities and will help with data proofing. Data and techniques will be reviewed externally on an ongoing basis. External reviewers include NMFS personnel as part of the broader NMFS co-management program, other Sentinel programs such as the St. Paul ECO office, and external scientific advisors. Such external reviews will continue to ensure that high quality data is collected and maintained and will help foster a network of experts to reinforce data quality standards.

Education and Outreach

The BeringWatch program provides an excellent opportunity for local-scale education and outreach to multiple sectors of the community. The flexibility and accessibility of the descriptive interface of the BeringWatch online database provides an easy to use vehicle for local users to enter observations pertaining to the local environment. This information can then be summarized and displayed on the BeringWatch webpage for the general public (*http://www.BeringWatch.net/joomla/*). The BeringWatch webpage is a content management web page which can be accessed and used by designated observers and lead members of each community. The technical infrastructure for

the page has been set up so that articles of interest for each community and data summaries can easily be posted to the BeringWatch page on a regular basis with no formal XML programming experience. Text and images are added to the page using a simple text editing interface. Images that are uploaded to the BeringWatch database can be automatically imported to the webpage gallery if the user wishes to do so. Overall, the webpage is designed as a means to communicate the results of the BeringWatch community-based monitoring between local communities.

In addition to broadly targeted outreach via the BeringWatch webpage, a targeted series of simple projects are planned through which local students will be able to use the BeringWatch database to enter observations of local wildlife and display the results on the webpage. A collaboration with the Pribilof School District is designing projects where students follow a predefined protocol to collect data on local wildlife. An example project is the use of the remote video camera installed at Dalnoi Point on St. George Island to monitor Steller sea lions. Students will work with local observers to conduct census counts and look for branded sea lions from images and recorded by the Dalnoi Point camera. Student data will be recorded in the online database and posted on the BeringWatch webpage. If the Pribilof School District pilot project is successful, these efforts will be extended to other communities.

Summary and Conclusions

The BeringWatch methodology is currently operating or ramping up operations in a number of Bering Sea communities on the Pribilof and Aleutian Islands in conjunction with the Island Sentinel Programs. In addition to these communities, the BeringWatch methodology is also being integrated into a number of communities in Russia, in the western Bering Sea. Over the next five years we envision the program including a number of additional communities throughout the Bering Sea and the potential to export the model to other geographic regions. More importantly we are witnessing the direct empowerment of local communities in the long-term stewardship of the environment and a meaningful dialogue between locals and outside environmental authorities. We see these developments as a significant turning point that is critical to any ultimate conservation success. Moreover, it has given locals a sense of purpose and power, and is helping to build bridges between community elders and the new internet savvy generations of today – the local leaders of tomorrow.

Photograph courtesy of authors

Figure 2. Scanning for killer whales from shore with "Big Eye" binoculars on St. George Island, 2008.

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